

July 2, 2018

**VIA ELECTRONIC MAIL**

Sheryl Bilbrey  
EPA Region 10  
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Re: Quendall Terminals – STAR Bench Study and Pilot Study

Dear Sheryl,

Georgia Baxter and I want to thank you and your team for meeting with potential Quendall Terminals developers. We understand the developers found the meetings to be very helpful as they continue to evaluate their interest in Quendall Terminals. At the meetings, they learned and expressed concern about the potential use of the STAR technology and they continue to be concerned that STAR is experimental and available from only one vendor. This is consistent with the concerns Georgia and I expressed to you when we met. The developers need as much certainty as possible and the potential use of STAR adds to the level of uncertainty present in an already challenging Superfund process.

We recently received a copy of the STAR bench test results and were quite surprised that Region 10 staff considers the test a success. The bench test was designed to test soil from two targeted hot spots but EPA found it difficult to even obtain representative samples in one of the locations. For the same reason it was difficult to obtain a sample, it will be difficult to implement STAR at Quendall Terminals – the DNAPL is discontinuous. There is no question that DNAPL can be combusted but small DNAPL stringers make it impossible to successfully implement a technology that relies on a continuous source of fuel for combustion. In much of the DNAPL-impacted area that is identified for treatment under EPA's preferred remedy, there is likely insufficient density of fuel (DNAPL) to drive combustion. Thus, we anticipate – as EPA itself has indicated in previous meetings – that STAR, even if the pilot test is effective (which is highly uncertain), may only be applicable in localized areas of the Site, and that EPA's remedy targeting all Site DNAPL will still require substantial in-situ stabilization (ISS). Therefore, the advantages of STAR highlighted in the pilot test plan (i.e. reduced odor generation and reduced impacts to future development) are highly unlikely to be realized; rather, implementing multiple technologies including the unproven STAR technology will only increase the remedy's cost, complexity, and uncertainty.

We understand Region 10 considers the bench test a success and is proceeding with the pilot test this summer. We are surprised by that conclusion because even the vendor reported the bench

test had only a 50 percent success rate (i.e., only one of the two samples exhibited self-sustaining combustion.) In addition, the “successful” test did not achieve cleanup levels for some contaminants of concern (e.g., naphthalene). If this technology is only 50 percent successful (even though EPA hand selected the specific samples to be tested) and cannot achieve cleanup levels in a laboratory environment (where the test conditions are controlled), we anticipate it will be even less effective during full scale implementation.

Furthermore, we are concerned that the pilot study will not provide adequate data, representative of the highly variable Site conditions, to evaluate the effectiveness and cost of implementing STAR. In particular:

- We were surprised that a cap over the treatment area was not included in the pilot study. Given the shallow depth to groundwater, soil heterogeneity, and the unpaved surface, it is highly unlikely that soil vapor extraction will fully capture Site emissions during treatment. This will lead to inaccurate assessment of the mass combusted and inaccurate full-scale soil vapor extraction design. We also suspect the neighboring property owners and Seahawks fans attending summer events at the neighboring training camp may be concerned about potential vapor emissions during the pilot test.
- The area chosen for the pilot treatment system (near former borings QP-6 and QP-7) targets an area that is not representative of more typical site conditions that present particular challenges to the efficacy of the STAR technology. In particular, DNAPL at QP-6 and QP-7 is present in a single thick layer, rather than in multiple layers as is commonly observed throughout the Site. Whether an area to be treated requires one level (i.e. targeted depth horizon) or multiple levels of ignitors/air injectors to treat multiple discrete stringers of DNAPL has huge cost implications. We question whether it will be possible to actually find the discontinuous small stringers of DNAPL so that the STAR ignitors/air injectors can be installed into each layer. Furthermore, the likelihood of injecting adequate air and having sufficient hydrocarbon mass to sustain combustion is lower in areas where thin stringers of DNAPL are sandwiched between low permeability silts and peats. The proposed pilot test location does not evaluate this condition.
- The pilot study work plan indicates that hydrocarbon destruction rates will be estimated using CO and CO<sub>2</sub> data. However, there is substantial natural organic material in the subsurface (e.g., peat and organic silt) that will likely be combusted as well. How will the pilot test distinguish between these sources? If it does not distinguish between the sources then the pilot test results will be biased (i.e., estimated DNAPL destruction rates will be higher than actual results.)

In addition, we have concerns that natural organic matter combustion will become self-sustaining (i.e., cannot be stopped by shutting off air injection). We were surprised to see no discussion of this issue, or a contingency plan for extinguishment was it to occur.

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We thought it was important that we share our concerns with you because we know they are also the concerns of any potential developer. We have an opportunity to see this Site redeveloped but not if EPA increases the level of uncertainty through the use of STAR.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Cugini", with a long horizontal flourish extending to the right.

Robert Cugini

cc: James Woolford  
Ted Yackulic  
Georgia Baxter  
Lynn Manolopoulos  
Jim Benedict